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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/625,893	07/26/2000	Donald Wayne Allen	TH1258 (US)	8026

7590 02/27/2002

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EXAMINER
MITCHELL, KATHERINE W

ART UNIT	PAPER NUMBER
3673	

DATE MAILED: 02/27/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

713 241-6617 fax

Office Action Summary	Application No. 09/625,893	Applicant(s) DUPAL ET AL.	
	Examiner Katherine W Mitchell	Art Unit 3673	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 January 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☒ The proposed drawing correction filed on *25 January 2002* is: a)☒ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *4* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:

Nowhere in the specification can the examiner find the term "RMS", as used on page 8 line 10 and Figure 15, defined.

Appropriate correction is required.

Claim Rejections – 35 U.S.C. 112

2. Claims 2-3 and 5-6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "K/D" and the definition of "D" were added in claims 1 and 4. Claims 2 and 3 depend from claim 1, and claim 2 defines "D" differently than claim "3"; thus the meaning of "D" in claim 1 is made inconsistent. Similarly, claims 5 and 6 depend from claim 4 and claim 5 defines "D" differently than claim "6"; thus the meaning of "D" in claim 1 is made inconsistent.

Claim Rejections – 35 U.S.C. 102

3. Claims 1-6 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Gregory, US Patent 4470722. Gregory teaches in column 4 lines 59-65 a cylindrical housing element for use with a marine production facility that has an exterior coating of fiberglass or plastic. Although "ultra-smooth" is never explicitly stated by Gregory, applicant states in page 5 line 23-

page 6 line 4 that the "ultra-smooth surface could be provided by sleeves made of copper, carbon fiber, rubber, or any sufficiently smooth thermoplastic, metal alloy, or other material. Examiner notes that applicant did not place any further description or limitations on the materials listed, and one of ordinary skill in the art would use "standard" fiberglass or plastic as normally used on or for pipes. Applicant on page 8 line 15 states that an example of ultra-smooth was 5.1×10^{-5} K/D. Thus if plastic is ultra-smooth, and ultra-smooth has a K/D of 5.1×10^{-5}, the plastic or fiberglass cylindrical housing of Gregory must inherently have a K/D of 5.1×10^{-5} or smaller. Thus the material in Gregory would also meet the amended limitation of 1×10^{-4} or less as described.

4. Claims 1 and 4 are rejected under 35 U.S.C. 102 (b) as being anticipated by Allen and Henning, Vortex-Induced Vibration Tests of a Flexible Smooth Cylinder at Supercritical Reynolds Numbers, May 1997, hereafter called the Allen et al. paper. The Allen et al. paper teaches on page 681, col 1, 2nd - 4th full paragraphs a method and system for controlling drag and vortex induced vibration, comprising a cylinder element of ABS® or PVC plastic with a surface roughness of k/D between 8.86×10^{-5} to 1.51×10^{-4}. Note that page 683 "Stationary Cylinder Results" states "the differences between present data and data from most of the included resources in Figure 4 are probably related to surface roughness, as is consistent in ...from Shih et al (1992)." Page 684 concludes that tests using the cylinder elements of said k/D range resulted in determining that surface roughness had an important effect on drag and VIV response of circular cylinders.

Claim Rejections – 35 U.S.C. 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-6 are rejected under 35 U.S.C. 103(a) as obvious over Blevins et al. US Patent 6206614 in view of Mech 441: Losses In Piping, revised by Rick Sellens 96.09.09, hereafter called Mech 441; or CE/ME 101 abc handout#5, Incompressible Flow over a Circular Cylinder, hereafter called CE/ME 101; or Drag of Blunt Bodies and Streamlined Bodies; or Transition Prediction in Flow over Roughness Elements; or the email dated August 20, 2001 from Princeton University Chair of Mechanical and Aerospace Engineering Professor A.J. Smits discussing the widespread knowledge since around 1900 of the effect of smooth surfaces on reducing turbulent flow.

Blevins et al teaches in Figure 14 a substantially cylindrical sleeve and a method for controlling vortex induced vibration based on relative position. However, Blevins et al. are silent on the material of construction, and do not teach the specific feature that the surface, or the surface coating, should be ultra-smooth or with a K/D ratio of $1x10^{-4}$ or less. Examiner takes official notice, backed up by Mech 441 or CE/ME 101 or Drag of Blunt Bodies and Streamlined Bodies, or Transition Prediction in Flow over Roughness Elements, that smooth surfaces are known (by all of ordinary skill in the field of fluid dynamics or physics) to create less turbulent flow that rough surfaces. Mech 441 refers, on page 2, lines 4-5, to the relative roughness, ξ/D, which is defined exactly

as applicant defines his K/D factor; that is, as the ratio of height of the typical or average roughness element to the pipe diameter. Mech 441 relates the friction factor, and thus the drag coefficient, to the Reynolds Number and relative roughness on page 3, the top diagram. This diagram shows that at a given Reynolds number, the friction factor increases as the relative roughness increases. While this is for flow inside a pipe, CE/ME 101, or Drag of Blunt Bodies and Streamlined Bodies, or Transition Prediction in Flow over Roughness Elements all teach that relative roughness increases turbulent flow and drag over cylinders, and the outside of a pipe is a cylinder. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Blevins et al. in view of Mech 441: Losses In Piping, revised by Rick Sellens 96.09.09, or CE/ME 101 abc handout#5, Incompressible Flow over a Circular Cylinder, or Drag of Blunt Bodies and Streamlined Bodies, or Transition Prediction in Flow over Roughness Elements or the email dated August 20, 2001 from Princeton University Department Chair Professor A.J. Smits to include sleeves or fairings with smooth surfaces or smooth surface coatings in order to minimize drag and friction over the outside surface to reflect known laws of fluid dynamics.

7. Claims 2-3 and 5-6 are rejected under 35 U.S.C. 103 (a) as obvious over Allen and Henning, Vortex-Induced Vibration Tests of a Flexible Smooth Cylinder at Supercritical Reynolds Numbers, May 1997, hereafter called the Allen et al. paper. The Allen paper, as discussed above, teaches all the elements except that the cylinders can be made ultra-smooth by a coating or sleeve. Coatings and sleeves were developed to impart properties needed on a surface without having to make the entire apparatus of

the coating or sleeve material. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Allen et al. paper to include sleeves or fairings with smooth surfaces or smooth surface coatings in order to minimize drag and friction over the surface to reflect known laws of fluid dynamics in a manner than minimized cost and costly materials.

8. Claims 1-6 are rejected under 35 U.S.C. 103(a) as obvious over Gregory, US Patent 4470722 in view of Roberson and Crowe, Engineering Fluid Mechanics, 5th Ed., Houghton Mifflin Co, © 1993, chapter 10, pages 428-429, hereafter refered to as Roberson et al. Gregory teaches in column 4 lines 59-65 a cylindrical housing element for use with a marine production facility that has an exterior coating of fiberglass or plastic. Although "ultra-smooth" is never explicitly stated by Gregory, applicant states in page 5 line 23-page 6 line 4 that the "ultra-smooth surface could be provided by sleeves made of copper, carbon fiber, rubber, or any sufficiently smooth thermoplastic, metal alloy, or other material. Examiner notes that applicant did not place any further description or limitations on the materials listed, and one of ordinary skill in the art would use "standard" fiberglass or plastic as normally used on or for pipes. Applicant on page 8 line 15 states that an example of ultra-smooth was 5.1×10^{-5} K/D. Thus if plastic is ultra-smooth, and ultra-smooth has a K/D of 5.1×10^{-5}, the plastic or fiberglass cylindrical housing of Gregory must inherently have a K/D of 5.1×10^{-5} or smaller. Thus the material in Gregory would also meet the amended limitation of 1×10^{-4} or less as described. However, Roberson et al. show in the Fig 10.8 legend that glass and plastic pipe are considered smooth, or at least smoother than copper or brass tubing, which

has a k_s (equivalent sand roughness) of $5x10^{-6}$ (in feet). Examiner notes that no reference requires plastic or glass pipe to be further described in terms of phase or manufacturing method, as those skilled in the art recognize that, for example, plastic pipe has certain inherent properties, and the smoothness of the surface is inherent, and would select the "standard" plastics, glass, or fiberglass used in the piping industry. Thus k_s /D for copper or brass tubing with diameters of 100 feet or less would be $5x10^{-6}$ /100, or less, or $5x10^{-4}$ or less. Thus if plastic and glass are smoother than copper or brass tubing, any common plastic or glass pipe surface would meet the k_s /D of $1x10^{-4}$ or less criteria described for ultra-smooth. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Gregory to include industry standard smooth surfaces or smooth surface coatings in order to minimize drag and friction over the surface to reflect known laws of fluid dynamics in a manner than minimized cost and costly materials.

9. Claims 1, 3, 4, and 6 are rejected under 35 U.S.C. 103 (a) as being obvious over Ortloff et al., US Patent 4398487 in view of Brown et al. US Patent 6148751. Ortloff et al. disclose in column 5 lines 29-37 a fairing made of thermoplastic or aluminum or nickel alloys, or plastic reinforced with fibreglass. Although "ultra-smooth" is never explicitly stated by Ortloff et al., applicant states in page 5 line 23-page 6 line 4 that the "ultra-smooth surface could be provided by sleeves made of copper, carbon fiber, rubber, or any sufficiently smooth thermoplastic, metal alloy, or other material. Applicant on page 8 line 15 states that an example of ultra-smooth was 5.1×10^{-5} K/D. Thus if thermoplastic is ultra-smooth, and ultra-smooth has a K/D of $5.1x10^{-5}$, the

thermoplastic fairing of Ortloff et al. must have a K/D of $5.1x10^{-5}$ or smaller. Examiner notes that applicant did not place any further description or limitations on the materials listed, and one of ordinary skill in the art would use "standard" fiberglass or plastic as normally used on or for pipes. Applicant on page 8 line 15 states that an example of ultra-smooth was 5.1×10^{-5} K/D. Thus if plastic is ultra-smooth, and ultra-smooth has a K/D of $5.1x10^{-5}$, the plastic or fiberglass cylindrical housing of Ortloff et al. must inherently have a K/D of $5.1x10^{-5}$ or smaller. Thus the material in Ortloff et al. would also meet the amended limitation of $1x10^{-4}$ or less as described. However, Ortloff et al. do not teach that the surface is substantially cylindrical. Brown et al. teach in col 2 lines 61-col 3 line 31 and Figs. 4B-d and 5C a substantially cylindrical bluff hull which can be circular-cylindrical in shape. Note that Brown teaches in col 2 lines 25-53 that common shapes for fluid-submersed hulls include circular-cylindrical forms. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Ortloff et al. to include industry standard smooth surfaces or smooth surface coatings of a substantially circular-cylindrical shape in order to minimize drag and friction over the surface to reflect known laws of fluid dynamics in a manner than minimized cost, costly materials, and modifications to existing handling and production apparatus.

Response to Arguments

10. Examiner accepts the arguments regarding the Ortloff 102 (b) rejection and is canceling the rejection.

11. Applicant's arguments filed Nov. 29, 2001 have been fully considered but they are not persuasive. Regarding the rejection anticipated by Gregory, examiner apologizes for the "cut and paste" error in paragraph 11. Arguments regarding Gregory are moot since the reference has been removed as a teaching of material.

12. Examiner notes that Gregory states in col 6 lines 11-21 that "the invention reduces the drag forces and vibrations associated with vortex shedding around multi-conduit production risers"; thus supporting the examiner's view that VIV suppression was a problem of concern to the Gregory patent.

Examiner considered the "False Analogy" argument, but also concludes that applicant included "any sufficiently smooth thermoplastic, metal alloy, or other material" in the specification, *without further limitation*, as meeting the definition of "ultra-smooth", and defined "ultra-smooth" as comprising $5.1x10^{-4}$ K/D, $1x10^{-4}$ K/D, and $1x10^{-5}$ K/D. Examiner believes that plastics as disclosed by Gregory, such as plastic or shells with fiberglass coverings inherently would meet the K/D requirements of applicant.

13. Regarding the arguments of Blevins et al. in view of Mech 441: Losses In Piping, revised by Rick Sellens 96.09.09, hereafter called Mech 441, or CE/ME 101 abc handout#5, Incompressible Flow over a Circular Cylinder, hereafter called CE/ME 101, or Drag of Blunt Bodies and Streamlined Bodies, or Transition Prediction in Flow over Roughness Elements, or the email dated August 20, 2001 from Princeton University Chair of Mechanical and Aerospace Engineering Professor A.J. Smits discussing the widespread knowledge since around 1900 of the effect of smooth surfaces on reducing turbulent flow, applicant is arguing limitation not included in the claims. Nowhere in the

applicant's claims are limitations or properties of column spacing, number of columns, or a single element requirement included. Applicant does not include any limitations on the flow range, Reynolds number, drag, or Strouhal number. Therefore, the applicant's arguments are moot.

The examiner was not relying on the teaching of Blevins et al. for the material of construction, or the specific feature that the surface, or the surface coating, should be ultra-smooth or with a K/D ratio of $1x10^{-4}$ or less, and instead used the reference of Blevins et al in view of the references cited in paragraph 7 above. Therefore, the applicant's arguments that Blevins et al. fail to teach the surface material and properties are moot.

Conclusion

14. Applicant's submission of an information disclosure statement under 37 CFR 1.97(c) with the fee set forth in 37 CFR 1.17(p) on Jan 8, 2002 prompted the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 609(B)(2)(i). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

15. Applicant's amendment necessitated the new ground(s) of 112 rejections presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katherine W Mitchell whose telephone number is 703-305-6713. The examiner can normally be reached on Tuesday - Friday and alternate Mondays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Heather Shackelford can be reached on 703-308-2978. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-7687 for regular communications and 703-308-8623 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1113.

KWM
Feb 20, 2002

Gary Hartmann
Primary Patent Examiner
Group 3600